

VIRGINIA'S ARTIFICIAL REEF PROGRAM



Fishermen have known for centuries that fish congregate around shipwrecks and natural anomalies on the bottom of coastal waters, such as oyster rocks, exposed bed rock and coral reefs. This has resulted in attempts to artificially recreate these types of habitat in virtually every body of water in the world.

Attempts to replicate productive, natural fish habitat have led to the use of a variety of materials, from U. S. Army tanks and Christmas trees to derelict automobiles and their tires. A variety of ships and even some kitchen sinks have been sunk by enterprising reef builders. Some materials have worked well, while others seemed to disappear with the tide.

All of these efforts were attempts to create artificial reefs, which are man-made or natural materials intentionally placed upon the bottom of marine or freshwater environments to provide habitat for fish.

HOW REEFS WORK

A great portion of the bottom in coastal waters and the Chesapeake Bay consists of soft mud or shifting sand. This relatively stark, featureless environment offers little

attraction for many types of marine life. Natural and artificial reef areas provide places for a variety of marine life to live and food to eat.

The surface area, or hard substrate, of an artificial reef provides a place for encrusting organisms such as barnacles, mussels and tube worms to grow. Unable to live on soft or shifting bottom, these organisms attach themselves to hard surfaces. Most feed by filtering plankton and other small organisms from the water. Once this initial "fouling" community is established a wide variety of crustaceans, such as crabs and shrimp, and soft-bodied organisms, such as worms, appear. Then, the "food chain" continues to expand

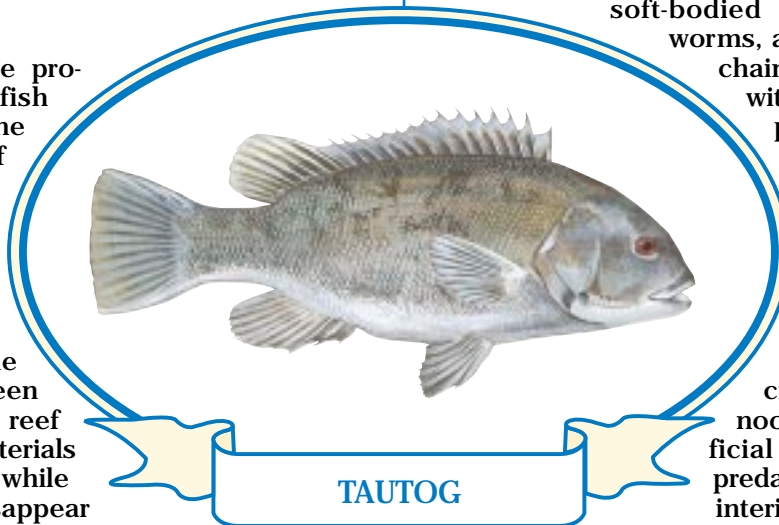
with the appearance of predators like tautog, which feed on crabs and mussels, and sea bass, which feed on crabs and shrimp.

Artificial reefs provide shelter for a variety of marine organisms. Fish and crabs seek out the nooks and crannies in artificial reefs to hide from predators. Fish use the larger interior areas of the structure to get away from wave action and currents, enabling them to expend less energy.

Deflected currents and eddies carry food to fish waiting to ambush an easy meal.

Reef dwelling fish appear to prefer low profile structures with numerous cavities. Tautog and sea bass, for example, can be found inside artificial reef structures, with tautog often nestling down into holes or cavities in or between structures.

Other species of fish, although not considered reef dwellers, can be found on artificial reefs. Schooling baitfish, such as anchovies,



Predators, possibly attracted by the abundance of food and the sense of protection afforded by reefs, are always present.



silversides, scad and menhaden, are attracted to high profile structures. These larger structures, such as shipwrecks, towers and bridges, may offer a point of orientation in an otherwise featureless environment and protection in their shadows.

Predators, possibly attracted by the abundance of food and the sense of protection afforded by reefs, are always present. Amberjack, bluefish, king mackerel, cobia, striped bass, and sharks are some of the species found around coastal and Chesapeake Bay reefs.

BUILDING ARTIFICIAL REEFS

Virginia's current Artificial Reef Program, which is managed by the Marine Resources Commission, traces its roots back over 40 years. In the 1950's recreational fishermen spearheaded efforts resulting in the sinking of automobile bodies, tires and over 100 surplus U.S. Navy landing craft and pontoon barge sections in the Chesapeake Bay and ocean waters off Virginia Beach.

The Marine Resources Commission became formally involved in reef building as the authorized recipient of six World War II Liberty ships in the early 1970's. These were scrapped and cleaned to U.S. Coast Guard, Environmental Protection Agency, and Army Corps of Engineers requirements, with great care taken to remove all oil and fuel residue.

All six vessels were sunk in offshore waters to form the popular Triangle Reef off Virginia Beach and the Parramore Reef off Wachapreague.

During the 1970's and early 1980's, the Artificial Reef Program primarily used "materials of opportunity" to create artificial reefs. Concrete pipe, ships, and automobile tires were used most often. In addition to simple deployments, attempts were made to use these materials to develop structures that provided stability, durability and a maximum amount of surface area and interior space. For example, tires were split and sunk vertically into concrete bases and concrete pipe was bundled into stacks.

From the mid 1980's into the late 1990's concrete structures were manufactured to complement materials of opportunity, which continued to provide a low cost method for building reefs. High profile structure was created with concrete "igloos". These structures measured 7-1/2 feet in height with a base spanning over 12 feet and weighed approximately 12,000 pounds. Low profile habitat was created with concrete tetrahedrons, which had a profile of approximately 40 inches and a weight of 500 pounds. The tetrahedron shape was chosen for its low center of gravity, which made the unit very stable. Ninety-nine igloos and thousands of tetrahedrons have been deployed on Virginia's artificial reefs.

As the 1990's drew to a close, various materials of opportunity, with the exception of automobile tires which proved difficult to



anchor on reef sites, became the primary structures used in reef construction once again. In 1996 and 1998 “Operation Reef-Ex” supplied surplus military vehicles in a major reef deployment effort in Virginia. Concrete bridge decking and pilings from several sources was used and provided excellent reef habitat. Regardless of the source or type of material used in reef construction, however, the Artificial Reef Program always ensured

A good way to locate a particular reef structure (or concentrations of structure) is to steer to the published coordinates for the structure and drop a small buoy. Then, run a circular or grid pattern around the buoy until the structure appears on a depth sounder. A second buoy can be deployed directly over the structure, and the exact coordinates should be recorded in the memory of your GPS or Loran C system and written in a log book.



that all reef materials were placed upon permitted reef sites and met rigorous state and federal environmental standards.

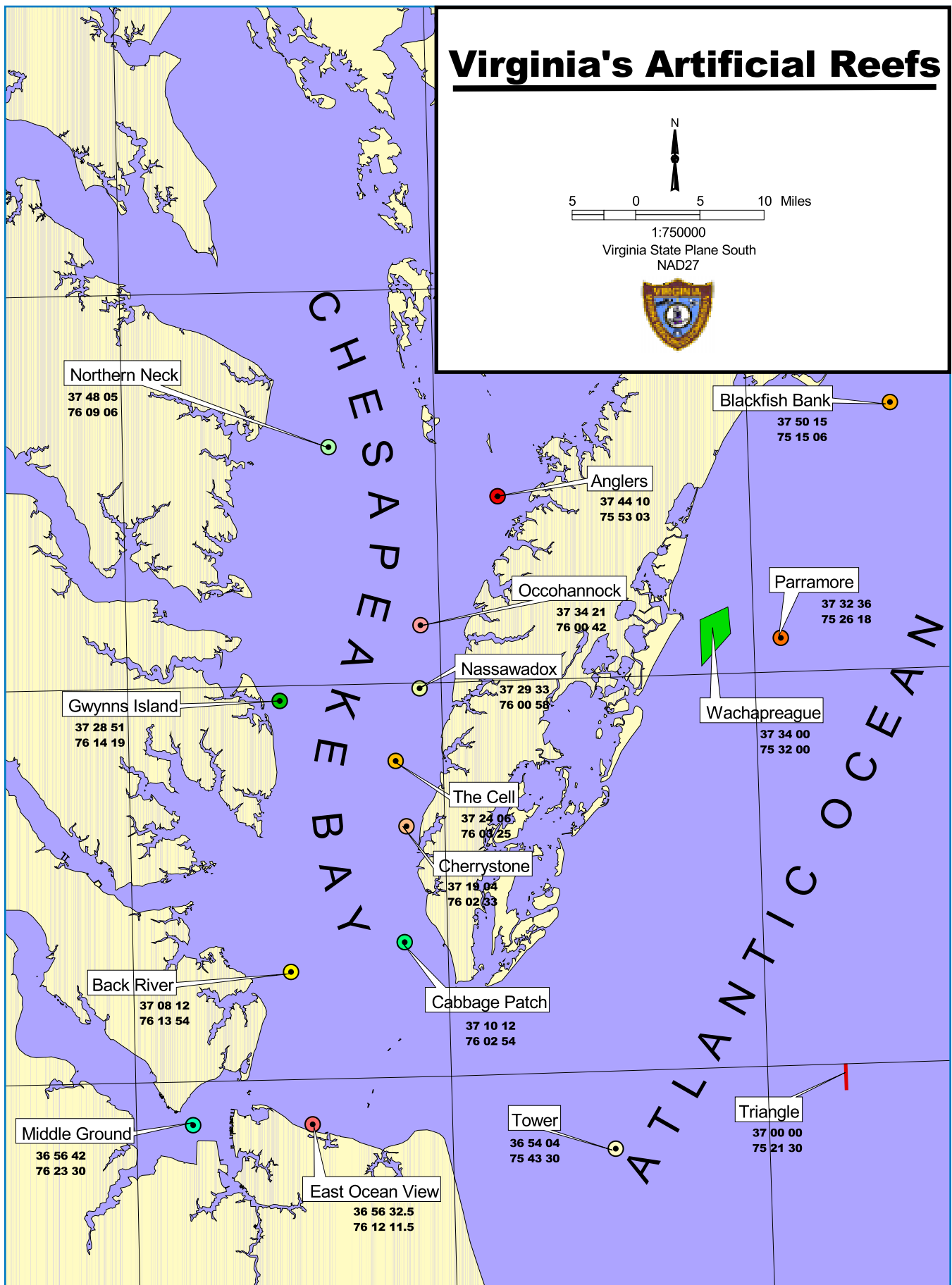
LOCATING ARTIFICIAL REEFS

Latitude/longitude coordinates used for positioning with GPS systems and Loran C coordinates are provided for major structures and deployment areas at each reef site. It is a good idea to remember there is some variation among GPS and Loran units, so position coordinates seldom match exactly. In addition, the GPS data is acquired through side-scan sonar surveys. This involves towing a transducer (tow-fish) behind a boat to locate the reef structures. The differential GPS receiver is on board the towing vessel, which creates a 25-30 foot difference between the receiving antenna of the GPS unit and the towed transducer. This creates small discrepancies in the actual latitude/longitude positions reported by the GPS unit and the actual positions of the reef structures. In many cases reported positions will denote or describe deployment “fields” within which are concentrations of structure.

Yellow buoys designate the locations of all permitted reefs in the Artificial Reef Program. However, these buoys may not be stationed directly over any structure. Buoys may be stationed in the center or on the perimeter of a reef site, or within a short distance of the published coordinates for structures on the reef site.

Storms, collisions and vandalism can cause the yellow buoys to be moved from their intended locations, and mooring locations may change during normal maintenance operations. Buoy status reports are available from the Artificial Reef Program office. If a yellow reef buoy is missing from a reef site, or appears to be improperly located, contact the Artificial Reef Program so corrective measures can be taken. The program address and phone number follow:

**Virginia Marine Resources Commission
Artificial Reef Program
P.O. Box 756
2600 Washington Ave.
Newport News, VA 23607-0756
(757) 247-2263**



ARTIFICIAL REEF SITES

ANGLER'S REEF

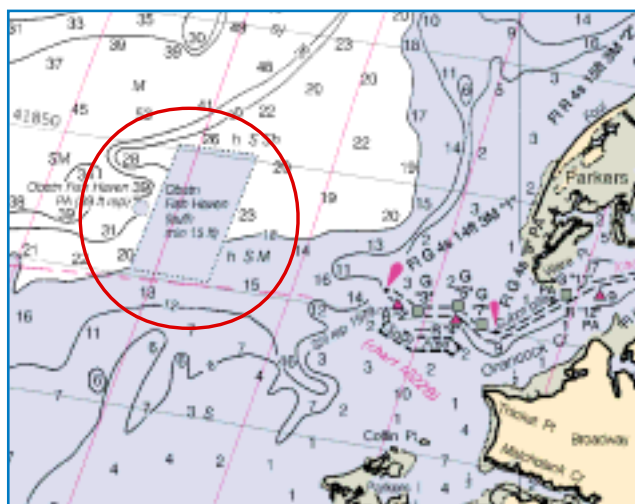
Angler's Reef is located approximately three nautical miles WNW of the mouth of Onancock Creek. The permitted site is rectangular with the perimeter defined by Loran C lines. More than 1600 concrete tetrahedrons have been deployed on the bottom in a circular pattern around the yellow buoy marking the site.

GPS & Loran C Coordinates

37 44.012N - 75 53.144W
(41845.9/27241.7)

Structures

1600 concrete tetrahedrons
placed in bundles of 5-6 each



NOAA Chart 12225

BACK RIVER REEF

This reef is located approximately three nautical miles east of Plumtree Point, off the mouth of the Back River. Forty concrete igloos have been placed on the bottom in an "X" shaped pattern, the centers of the igloos 50 feet apart. The legs of the "X" run NW - SE and NE - SW. The center of the "X" is located at GPS Coordinates 37 08.220N - 76 13.750W (41393.5/27254.2). Concrete tetrahedrons have been placed along each side of the northern legs of the reef, while concrete pipe, girders, and clusters augments the southern legs.

GPS & Loran C Coordinates

37 08.295N - 76 13.686W

37 08.254N - 76 13.675W

37 08.295N - 76 14.153W

37 08.174N - 76 14.013W

37 08.395N - 76 14.210W

(41394.2-/27255.5-/6)

Structures

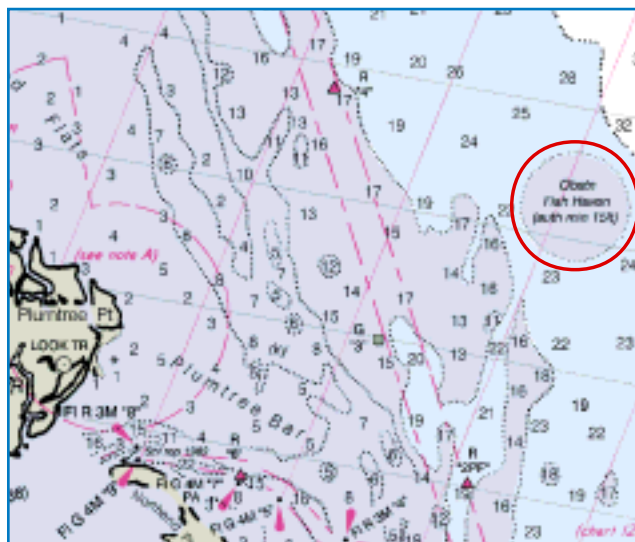
concrete bridge girders

concrete bridge girders

centerpoint of 200' diameter
concrete cluster

centerpoint of 100' diameter
concrete cluster

1000 tons of concrete pier rubble



NOAA Chart 12221

BLACKFISH BANK REEF

Located 5.8 nautical miles SE of Assateague Beach, Blackfish Bank Reef was developed through the efforts of the Town of Chincoteague and the Chincoteague Island Charterboat Association. The permitted site is rectangular in configuration and measures 1300 yards by 1600 yards. Forty armored personnel carriers were scattered at this site as part of "Operation Reef-Ex '98." This program of the New Jersey Army National Guard at Fort Dix transported and prepared military vehicles for artificial reef deployment. Actual deployment on the reef was a joint effort of the U.S. Naval Weapons Station Earle at Colt's Neck, NJ, the U.S. Army 24th Transportation Battalion at Fort Eustis, VA and the U. S. Coast Guard at Chincoteague.

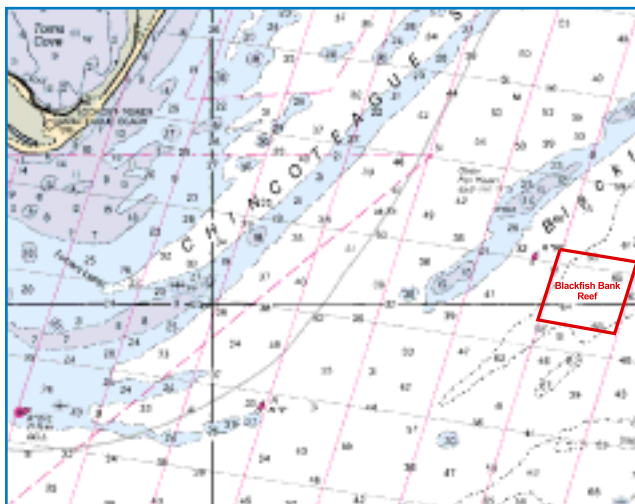
GPS & Loran C Coordinates

37 50.147N - 75 15.183W

(41967.2/27077.2)

Structures

centerpoint of 400' diameter
deployment of military vehicles'



NOAA Chart 12210

CABBAGE PATCH REEF

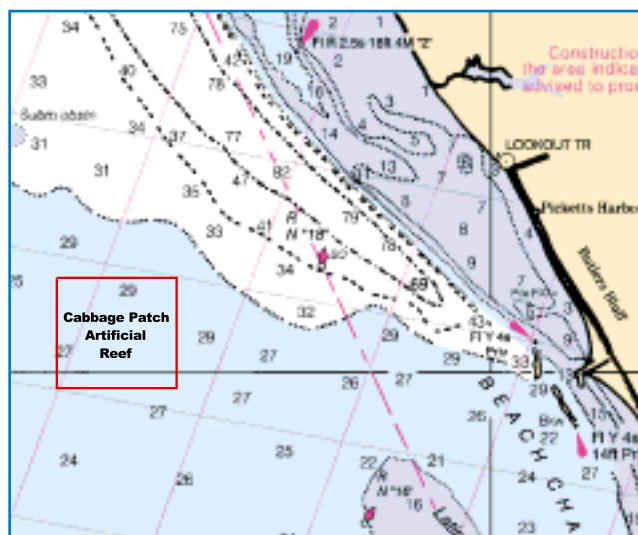
Constructed during the fall of 2000, this reef is located 5.5 miles SSW of the entrance to Cape Charles harbor. The initial deployment of "T-Beams", averaging 60 feet in length and 10 feet in width, provide structure with approximately four feet of profile off the Bay bottom. The building of this reef was the result of efforts by the Coastal Conservation Association of Virginia, Eastern Shore chapter, and it was funded with saltwater license revenues. The reef is marked with a yellow artificial reef program buoy. The structures are deployed in groups of four arranged in three distinct rows. The long axis of deployment runs east to west.

GPS Coordinates

37 10.311N - 76 02.964W

Structures

Center point of 36 "T" beams



NOAA Chart 12221

"THE CELL" REEF

The remains of the Wolf Trap Degaussing Station (The "Cell"), which is marked by Coast Guard obstruction buoy WT2, is the major structure on this circular reef site. Concrete tetrahedrons and "tire-in-concrete" units (TICs) have been deployed in a circular pattern around a yellow artificial reef buoy stationed at 37 24.065N - 76 03.407W. The Cell Reef is located due west of the mouth of Hungars Creek on the Eastern Shore Bayside.

GPS & Loran C Coordinates

37 24.299N - 76 03.662W

37 24.196N - 76 03.645W

(41598.3/27245.0)

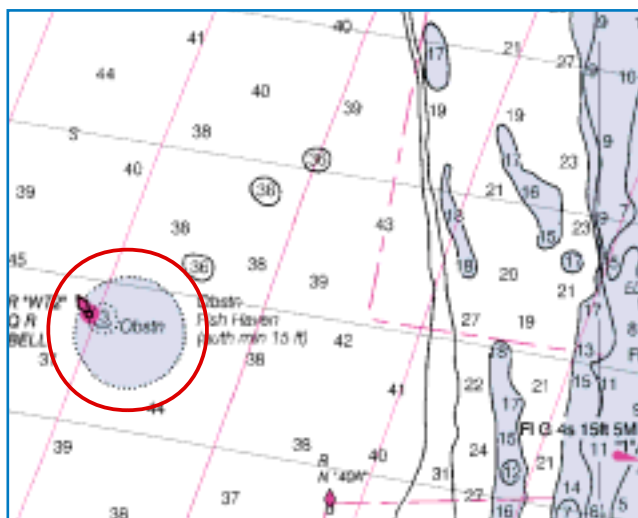
37 24.149N - 76 03.417W

Structures

portions of the foundation of the "CELL" degaussing station

200' wide field of low profile material

*Top of structure is extremely irregular and portions may be very close to the surface; boaters are advised to exercise caution.



NOAA Chart 12225

CHERRYSTONE REEF

This circular reef site is situated NNW of the mouth of Cherrystone Creek on the Eastern Shore bayside. Over 2900 TICs have been scattered around this buoyed location. A cluster of concrete igloos is located at 41541.2/27231.0 (Loran C Coordinates) and several stacks of concrete pipe are positioned at (41539.0/27230.8). The major structure at this site is concrete deck sections from the Chesapeake Bay Bridge-Tunnel. Tidal currents tend to be strong in this area.

GPS Coordinates

37 19.038N - 76 02.468W

37 19.223N - 76 02.732W

37 19.072N - 76 02.734W

37 19.137N - 76 02.843W

37 19.042N - 76 02.864W

37 19.229N - 76 02.787W

37 19.137N - 76 02.807W

37 19.069N - 76 02.780W

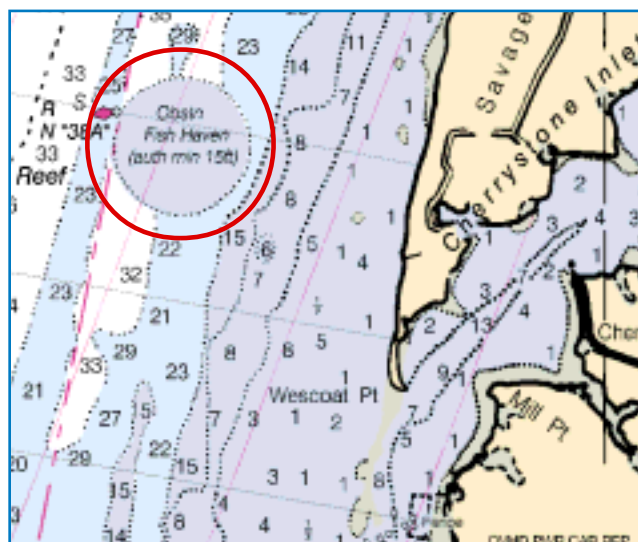
Structures

centerpoint (buoyed) of 67 concrete deck sections from CBBT

end points of 100' wide field of concrete tetrahedrons

end points of 200' wide field of concrete tetrahedrons & TICs

points within a field of concrete tetrahedrons & TICs



NOAA Chart 12221

EAST OCEAN VIEW REEF

Originally referred to as the ODU Reef, this circular reef site is located 2500 yards west of the entrance to Little Creek, approximately 900 yards off the beach. The original reef site was a rectangular grid with 40 concrete igloos deployed south of the center. Immediately north of the center are 1000 tons of concrete bridge rubble, supplied and deployed at no cost by McLean Contracting Company. Concrete tetrahedrons have been scattered among the igloos.

GPS & Loran C Coordinates

36 56.600N - 76 12.150W
(41259.8/27224.5)

Structures

Reef Center

36 56.587N - 76 12.191W

36 56.589N - 76 12.156W

36 56.491N - 76 12.223W

36 56.488N - 76 12.181W

Corner boundaries of field of structures in the northern portion of reef

36 56.513N - 76 12.195W

36 56.525N - 76 12.142W

36 56.491N - 76 12.223W

36 56.488N - 76 12.181W

Corner boundaries of field of structures in the southern portion of reef

GWYNN ISLAND REEF

The Gwynn Island Reef is a circular reef site located 1.35 nautical miles NE of the "Hole in the Wall". The site is buoyed and features a variety of sunken structures, including 3762 tons of bridge decking supplied and deployed at no charge by McLean Contracting Company.

GPS & Loran C Coordinates

37 28.850N - 76 14.300W
(41637.1/27299.6)

41637.4/27299.5

37 28.857N - 76 14.263W

37 28.916N - 76 14.319W

37 28.801N - 76 14.323W

37 29.077N - 76 14.079W

Structures

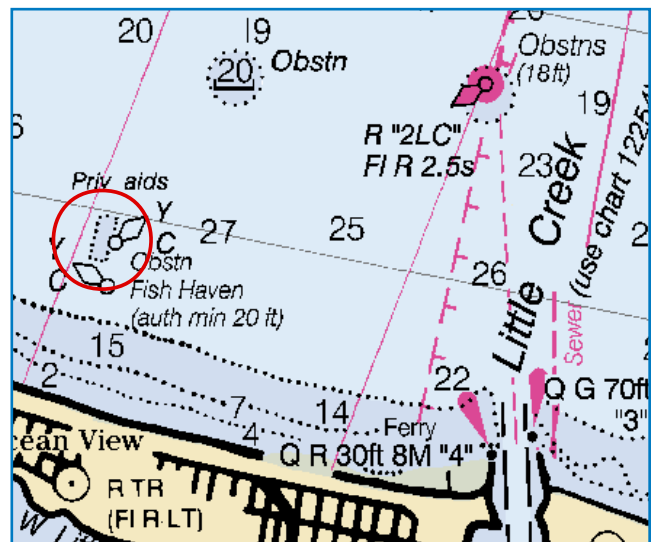
reef center and center of deployment of 6 concrete igloos

3762 tons of bridge decking

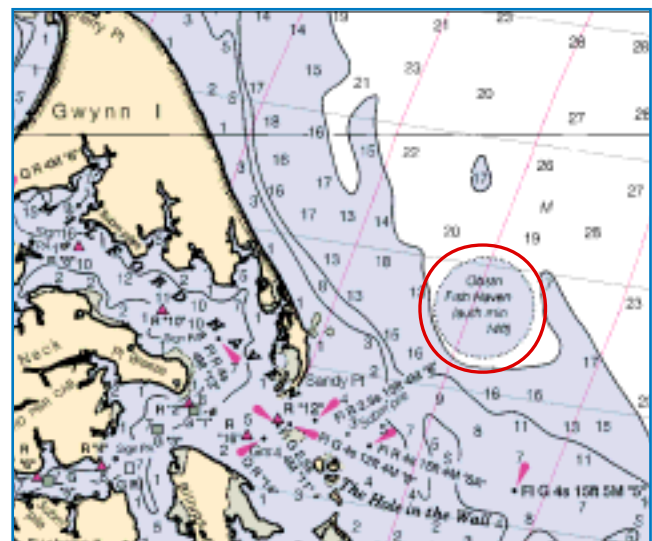
cluster of concrete igloos and TICs

end points of a 300' wide field of TICs

small cluster of concrete tetrahedrons



NOAA Chart 12221



NOAA Chart 12225

NASSAWADOX REEF

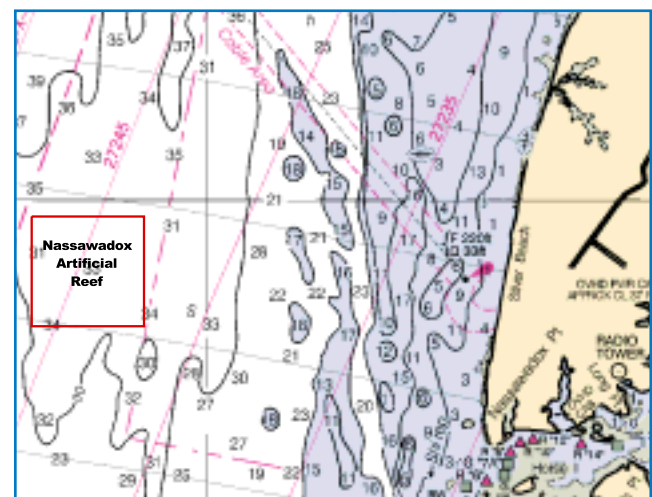
Concrete "T-Beam" structures identical to those placed upon the Cabbage Patch reef were initially deployed to form this reef site. The reef is located 2.8 nautical miles NW of the mouth of Nassawadox Creek. The Coastal Conservation Association of Virginia, Eastern Shore chapter, spearheaded efforts to create this reef, and it was funded with saltwater fishing license revenues. A yellow artificial reef program buoy marks this reef. Concrete "T" beams deployed in groups of four arranged in four distinct rows comprise the major structures at this site. The long axis of deployment runs north to south.

GPS & Loran C Coordinates

37 29.578N - 76 00.956W
(41664.5/27244.0)

Structures

reef center and center of "T" beam deployment



NOAA Chart 12225

NEWPORT NEWS MIDDLE GROUND REEF

Located in Hampton Roads at the lower end of the James River, Newport News Middle Ground Light marks the center of the reef. Reef materials are placed in a ring around the light, no closer than 200 feet from the light and no farther than 1000 feet. Sunken structure includes reef balls, concrete rubble, and buoy sinkers. This is a dual purpose reef, serving as a recreational fishing reef and a brood stock sanctuary for clams. Juvenile clams are placed on the reef to enhance the clam population of the lower James River. These clams are not harvested, but remain on site to provide seed for the lower river areas. Many groups were instrumental in development of this reef including the Coastal Conservation Association of Virginia, Peninsula chapter, U.S. Coast Guard, Magann Construction Corp. and Brawley Middle School in Charlottesville.

GPS Coordinates

36 56.617N - 76 23.459W

36 56.628N - 76 23.536W

36 56.760N - 76 23.597W

36 56.719N - 76 23.566W

Structures

centerpoint of 150' diameter concrete cluster

centerpoint of 400' diameter concrete cluster

centerpoint of 300' diameter concrete cluster

small deployment of reef balls

NORTHERN NECK REEF

This rectangular reef site, with its perimeter defined by Loran C lines, is located approximately 7 nautical miles east of the Great Wicomico River Light. More than 1600 concrete tetrahedrons have been deployed on the bottom in a circular pattern around the yellow buoy marking the site. The structures are located approximately 100 feet from the buoy in a band 200 feet wide.

GPS & Loran C Coordinates

37 48.069N - 76 09.293W
(41872.2/27322.40)

Structures

1600 concrete tetrahedrons
placed in bundles of 5-6 each

OCCOHANNOCK REEF

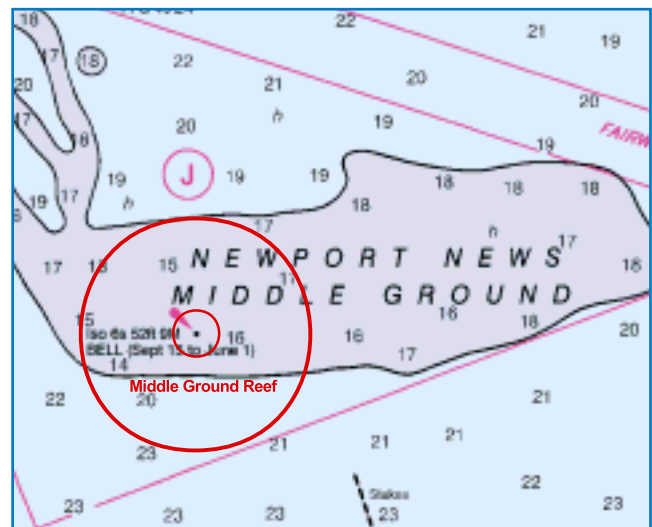
Occohannock Reef, which is rectangular in configuration, was initially developed in early 1997. The perimeter of the reef is bounded by Loran C lines 41724, 41718, 27256, and 27251. The site is centered approximately 4 nautical miles WNW of the mouth of Occohannock Creek. A yellow buoy marks the centerpoint of the initial deployment of 1200 concrete tetrahedrons.

GPS & Loran C Coordinates

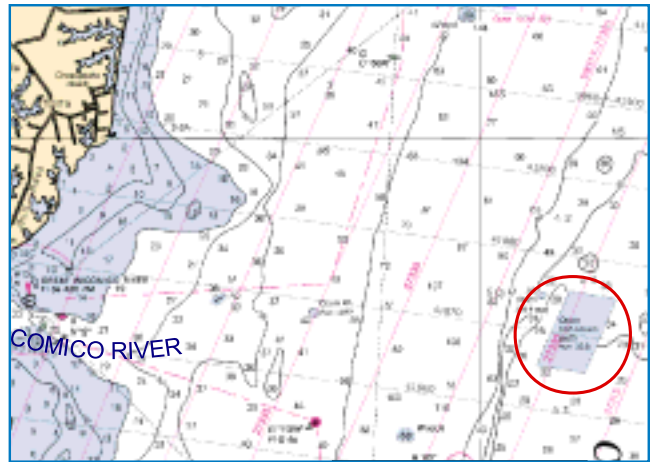
37 34.350N - 76 00.699W
(41721.5/27253.9)

Structures

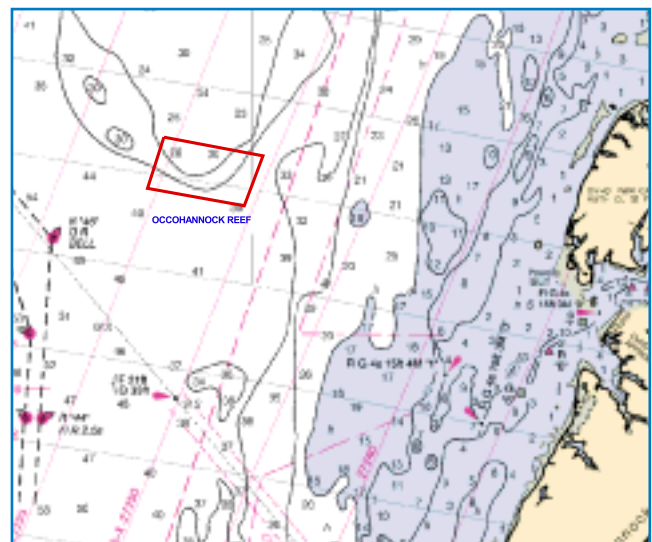
1200 concrete tetrahedrons



NOAA Chart 12245



NOAA Chart 12225



NOAA Chart 12225

PARRAMORE REEF

A pair of Liberty Ships, the Page and Mona Isle, are the main structures on this circular reef site located 8.7 nautical miles on a bearing of 102 degrees from the Parramore Coast Guard Tower. The ships were acquired and sunk through the efforts of the Seaside Sport Fishing Improvement Association, which was the original permittee of this reef site. The Liberty Ships are located at the extreme southern end of the reef site, while TICs are scattered around the center of the site.

GPS & Loran C Coordinates

37 32.000N – 75 26.275W
(41746.3/27095.5)

Structures

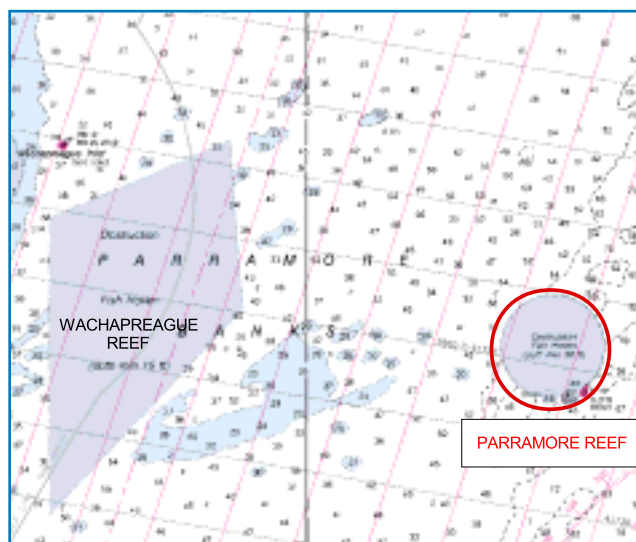
Liberty Ship, Page

37 31.830N – 75 26.420W
(41744.0/27096.0)

Liberty Ship, Mona Isle

37 32.680N – 75 26.300W
(41753.2/27096.9)

Coast Guard Barge



NOAA Chart 12210

TOWER REEF

Centered approximately .6 nautical miles WSW of the Chesapeake Light Tower, the Tower Reef was originally permitted to the Tidewater Artificial Reef Association of Virginia. TARA was responsible for the placement of more than 100 pontoon sections and numerous landing craft and other vessels on the site. Virginia's Artificial Reef Program added two barges and four drydock sections to the reef and scattered thousands of TICs on the circular site. The Electric Boat Division of General Dynamics deployed the deck barge and the Chesapeake Corporation deployed the hopper barge at no cost to the Artificial Reef Program.

GPS & Loran C Coordinates

36 54.133N – 75 43.350W
(41286.2/27103.0)

Structures

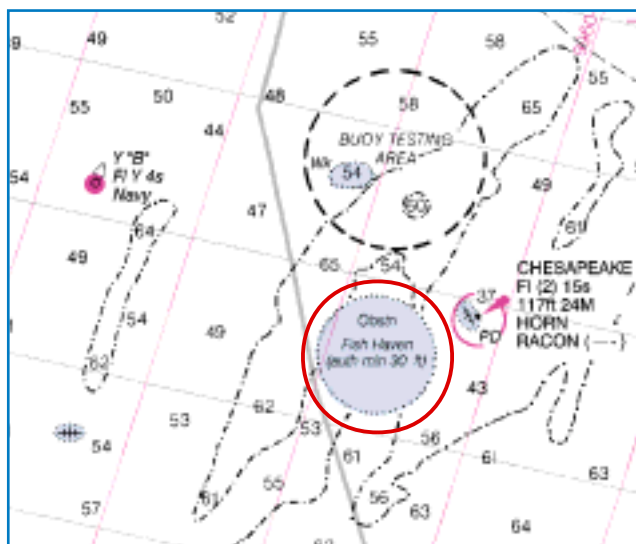
Four 60' x 80' drydock sections

36 54.050N – 75 43.350W
(41285.8/27102.8)

Deck barge w/ house (130' x 31')

36 54.100N – 75 43.250W
(41286.6/27102.8)

Hopper barge (195' x 35')



NOAA Chart 12221

TRIANGLE REEF

Four Liberty Ships and a Coast Guard cutter are the main structures on this rectangular reef site, which is located 16.5 nautical miles on a bearing of 73 degrees from the Chesapeake Light Tower. The Tidewater Artificial Reef Association of Virginia was the original permittee of this site and was instrumental in acquiring the four Liberty Ships.

Loran C Coordinates

41391.4/27020.2

Structures

Liberty Ship Webster

41390.7/27020.5

Liberty Ship George P. Garrison

41389.6/27020.9

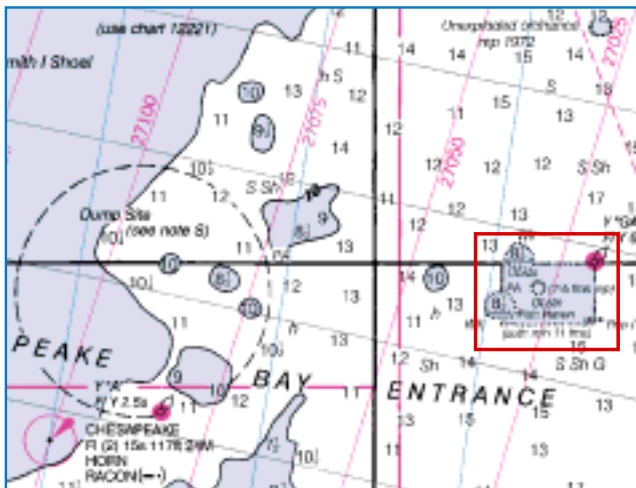
Liberty Ship James Haviland

41386.2/27018.9

Liberty Ship Edgar Clark

41369.6/27022.4

USCGC Ship Cuyahoga



NOAA Chart 12200

WACHAPREAGUE REEF

This small reef was developed as an offshore test site for experimental reef structures, and no additional materials have been added to the site. The reef is located approximately 3.8 nautical miles from the Parramore Coast Guard Tower.

GPS & Loran C Coordinates

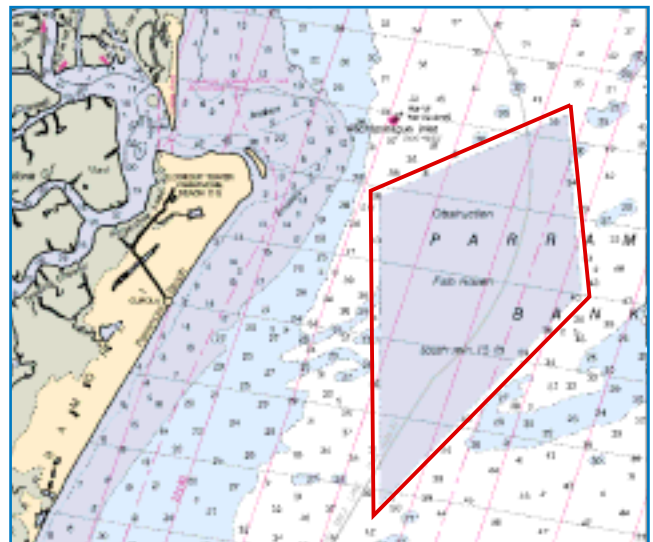
37 33.030N - 75 32.410W
(41747.5/27125.2)

Structures

6 concrete pipe stacks

37 32.500N - 75 32.870W
(41741.0/27126.1)

6 concrete igloos



NOAA Chart 12210

PROJECTED ARTIFICIAL REEF SITES

The Artificial Reef Program is working with groups of anglers on the Peninsula and the Northern Neck to acquire permits for two additional reefs in the Chesapeake Bay. One site is proposed for the York Spit area, and another is projected for the waters off the lower portion of the Northern Neck. Updates on these reefs will be posted on the Virginia Marine Resources Commission website: www.state.va.us/mrc/.

